PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Evaluate Salmon Supplementation Studies In Idaho Rivers

BPA project number: 8909802
Contract renewal date (mm/yyyy): 1/2000 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Nez Perce Tribe Department of Fisheries Resources Management

Business acronym (if appropriate) NPT

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
7.3B.2, 7.0A, 7.1B.1, 7.1C.3, 7.2A

FWS/NMFS Biological Opinion Number(s) which this project addresses
ESA Section 10 Permit 1164

Other planning document references
Snake River Recovery Plan 4.5.c., 4.1, 4.1B, 4.2; Wy-Kan-Ush-Mi-Wa-Kush-Wit 5B pages 14-23

Short description
Evaluate various supplementation strategies for maintaining and rebuilding spring/summer chinook populations in Idaho. Develop recommendations for the use of supplementation to rebuild naturally spawning populations.

Target species
Spring / summer chinook salmon (Oncorhynchus tshawytscha)

Section 2. Sorting and evaluation

Subbasin
Clearwater River, Salmon River

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☐ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☐ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20545	Salmon Supplementation in Idaho Rivers (ISS)
8909800	Idaho Dept. of Fish and Game - ISS cooperator
8909801	U.S. Fish and Wildlife Service - ISS cooperator
8909802	Nez Perce Tribe - ISS cooperator
8909803	Shoshone-Bannock Tribea - ISS cooperator

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
8909800	Idaho Dept. of Fish and Game	Cooperator on ISS Study
8909801	US Fish & Wildlife Service	Cooperator on ISS Study
8909803	Shosone-Bannock Tribes	Cooperator on ISS Study
9005500	Steelhead Supplementation Studies	Reciprocal transfer of data / coordination
8335000	Nez Perce Tribal Hatchery - O&M and M&E	Collects the emigration and adult escapement data on 3 ISS treatment or control streams, responsible for production of treatment fish.
9405000	Salmon River Habitat O&M/Monitoring and Evaluation	Reciprocal transfer of data / coordination
9705700	Salmon River Production Program	Reciprocal transfer of data / coordination

9703000	Listed Stock Adult Escapement	Collects adult escapement data on 2 ISS control streams
9102800	Monitoring Smolt Migration of Wild Snake River Spring/Summer Chinook Salmon	PIT tags summer parr in 5 control streams.
9604300	Johnson Creek Artificial Propagation Enhancement - O&M and M&E	Collects the emigration and adult escapement data on one ISS treatment stream, responsible for production of treatment fish.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1991	Identified study areas, brood stocks, facilities to be used.	Yes. Begin preliminary baseline data collection on treatment and control streams, target stock history, genetic sampling.
1992	Begin supplementation and monitoring of treatment streams and monitoring of control streams.	Yes. Initiated parr and smolt releases for treatment streams. Used existing hatchery brood stocks for first generation supplementation.
1993	Annual Report - Nez Perce Tribe	
1994	Annual Report - Nez Perce Tribe	
1996	Small scale investigation into chinook salmon supplementation strategies and techniques: 1992 -1994. Technical Reports. Peery, C.A. and T.C. Bjornn.	Yes. Completed small scale studies to monitor behavioral interactions between natural and hatchery fish.
1997	First generation returns, a known brood stock for supplementation is established.	Yes. Brood stock selection begins with local stocks of known origin.
1998	Five-year Report (1992-1997) in progress.	Yes. Summarize baseline data, review methodology, continue supplementation of treatment streams and monitoring of control streams, continue monitoring of juvenile survival and abundance, and monitoring of returns.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Monitor and evaluate the effects of supplementation on parr,	a	Continue to implement "standardized" spawning, rearing,

	presmolt and smolt numbers and spawning escapements of naturally produced salmon.		and marking and release protocols.
1		b	Differentially mark all hatchery supplementation and general production fish released in or nearby study streams.
1		c	PIT tag a minimum of 800 hatchery supplementation and general production fish released in or nearby study streams.
1		d	Release various life stages of chinook salmon. Determine fish numbers for each life stage based on existing natural production and natural rearing capacity.
1		e	Estimate late summer parr densities from snorkeling surveys.
1		f	Pit tag a minimum of 800 naturally produced parr from each treatment and control stream to estimate smolt production and survival.
1		g	Use existing weirs to collect, mark (PIT tag), and enumerate emigrating fish and to identify and enumerate returning adults.
1		h	Compare natural production of supplemented populations to unsupplemented populations and baseline data.
2	Monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation	a	Monitor productivity and genetic indices from supplemented populations and compare baseline and controls.
2		b	Monitor straying of hatchery supplementation fish into adjacent and control streams by weirs and carcass surveys.
2		c	Determine spawner to recruitment relationship based on determined production and productivity indices (parr and smolt numbers, adult escapements, survival, eggs/spawner etc.).
2		d	Predict population viability based on

			spawner to recruitment relationship to determine if the population will maintain itself through time in the absence of additional supplementation.
3	Determine which supplementation strategies (broodstock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity. (Long Term)	a	Monitor and evaluate natural production (presmolt, smolt and adult numbers) and productivity (survival, life stage characteristics, pathogens, straying, genetic composition) of supplemented populations and compare to baseline and controls.
3		b	Use local broodstocks with known natural component from the target population during the second generation of supplementation.
3		c	Compare natural production and productivity indices of supplemented populations using existing hatchery broodstocks (first generation) to populations using locally developed broodstocks (second generation).
3		d	Compare natural production and productivity indices among supplemented populations using parr, fall presmolt and smolt release strategies.
4	Develop Supplementation Recommendations. (Long Term)	a	Guidelines and recommendations will be developed addressing risks and benefits of supplementation (augmentation and restoration) in general and specific supplementation strategies (broodstock and release stage).
4		b	Use local brood stocks with known natural component from the target population during the second generation of supplementation.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measurable biological objective(s)	Milestone	FY2000 Cost %
1	5/1992	12/2015	Evaluation of	X	34.00%

			supplementation effects on numbers of presmolt and smolt, and spawning escapements of naturally produced salmon.		
2	5/1992	12/2015	Evaluate increases or decreases in number of naturally produced salmon. Evaluate genetic composition of target and adjacent populations following supplementation.	X	32.00%
3	5/1992	12/2015	Determine which brood stock and release stage result in the quickest and highest (if any) increase in natural production, without adversely effecting the productivity.	X	34.00%
4	1/1999	9/2015	Supplementation recommendations completed in final study report.	X	0.00%
				Total	100.00%

Schedule constraints
The continued decline of spring/summer chinook salmon returning to Idaho resulting in insufficient adult returns to provide target supplementation treatments.

Completion date
2015

Section 5. Budget

FY99 project budget (BPA obligated): $337,909

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%39	145,359
Fringe benefits		%9	33,369
Supplies, materials, non-	2 computers, snowmobile/ATV	%3	12,000

expendable property	trailer, field/office supplies		
Operations & maintenance	office services, rent, gas, repairs/ maintenance, training	%5	18,800
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	PIT tag station, 2 ATV, 2 snowmobiles	%8	32,000
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags: 11000	%8	31,900
Travel	GSA vehicles, lodging, per diem	%7	28,000
Indirect costs	NPT overhead @22.9%	%18	69,027
Subcontractor	Statistical and genetic analysis	%2	7,000
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			$377,455

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	
		%0	
Total project cost (including BPA portion)			$377,455

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$390,000	$400,000	$410,000	$420,000

Section 6. References

Watershed?	Reference
☐	Northwest Power Planning Council (NPPC). 1987. Columbia River Basin Fish and Wildlife Program. Portland, Oregon.
☐	Northwest Power Planning Council (NPPC). 1994. Columbia River Basin Fish and Wildlife Program. Portland, Oregon.
☐	Regional Assessment of Supplementation Project (RASP). 1991. Draft status report for review and comment. Prepared for Bonneville Power Administration PJSP, Portland, Oregon.
☐	Scheaffer, R.L., W. Mendenhall, and L. Ott. 1979. Elementary survey sampling, 2nd edition. Duxbury Press, North Scituate, Massachusetts.

☐	Smith, S.G., J.R. Skalski, J.W. Schlechte, A. Hoffman, and V. Cassen. 1994. SURPH.1 Manual. Statistical survival analysis for fish and wildlife tagging studies. Developed for the Bonneville Power Administration. University of Washington, Center for Quant
☐	itative Science.
☐	ISS Project reports
☐	Bowles, E. and E. Leitzinger, 1991. Salmon Supplementation Studies in Idaho Rivers. Experimental Design to the U.S. Department of Energy, Bonneville Power Administration. Project No. 89-098. Contact No. DE-BI79-89BP01466.
☐	Salmon Supplementation Studies in Idaho Rivers- Five year summary report. (In progress 1999).
☐	Peery, C.A. and T.C. Bjornn. 1996. Small-scale investigations into chinook salmon supplementation strategies and techniques: 1992-1994. Technical Report 96-3 ICFWRU, University of Idaho. IDFG and BPA, Portland, Oregon.
☐	Idaho Department of Fish and Game reports
☐	Lietzinger, E.J., K. Plaster, P. Hassemer, and P. Sankovich. 1996. Idaho supplementation studies annual progress report 1993. Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration, Portland, Oregon
☐	Lietzinger, E. J., K. Plaster, and E. Bowles. 1993. Idaho supplementation studies annual report 1991-1992. Fisheries Research Section, Idaho Department of Fish and Game annual report to U.S. Department of Energy - Bonneville Power Administration.
☐	Nemeth, D., K. Plaster, K. Apperson, J. Brostrom, T. Curet, and E. Brown. 1996. Idaho supplementation studies annual report 1994. Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration, Portland
☐	Nez Perce Tribe reports
☐	Arnsberg, B.D. 1993. Salmon Supplementation Studies in Idaho Rivers. Annual work summary for 1992. U.S. Department of Energy - Bonneville Power Administration. Portland, Oregon.
☐	Hesse, J.A. and B.D. Arnsberg 1994. Salmon Supplementation Studies in Idaho Rivers. Annual Report - 1993. U.S. Department of Energy - Bonneville Power Administration. Portland, Oregon.
☐	Hesse, J.A., P.J. Cleary, and B.D. Arnsberg. 1995. Salmon Supplementation Studies in Idaho Rivers. Annual Report - 1994. U.S. Department of Energy - Bonneville Power Administration. Portland, Oregon.
☐	Shoshone-Bannock Tribes reports
☐	Keith, R.M., M. Rowe, C.A.Reighn, J. Honena, and T. Trahant. 1996. Salmon Supplementation Studies in Idaho Rivers - Annual Report 1995. US Department of Energy - Bonneville Power Administration. Portland, Oregon.
☐	US Fish and Wildlife Service reports
☐	Rockhold, E.A., R.B. Roseberg, and J.M. Olson 1997. Idaho Supplementation Studies - Pete King and Clear Creeks progress report 1991-

	1993. US Department of Energy - Bonneville Power Administration. Portland, Oregon.

PART II - NARRATIVE

Section 7. Abstract

The goal of the Idaho Supplementation Studies Project is to evaluate the usefulness of supplementation as a recovery/restoration strategy for depressed stocks of spring and summer chinook salmon in Idaho. The project is a multi-agency effort, covering 30 streams throughout the Salmon River and Clearwater River basins, working to help define the potential role of chinook salmon supplementation in managing Idaho's natural spring and summer chinook populations, and identify genetic and ecological impacts to existing natural populations. The ISS experimental design is split into three main approaches: (1) Large scale population production and productivity studies designed to provide Snake River basin wide inferences. (2) Using study streams to evaluate specific supplementation programs. (3) Small-scale studies designed to evaluate specific hypotheses. Approaches one and two measure population responses to supplementation and are long-term studies. Approach three determines specific impacts of supplementation such as competition, dispersal, and behavior; and are short-term studies conducted in "controlled" environments. We expect this research to demonstrate the best methods for supplementing existing natural populations of chinook salmon and re-establishing natural populations in streams where chinook have become extirpated. We expect supplementation effects and recommendations to be different for each stream. The study design called for a minimum of 15 years of research (three generations). Sampling was initiated in 1991 and implementation began in 1992. The supplementation effects will be monitored and evaluated by comparing juvenile production and survival, fecundity, age structure, and genetic structure and variability in treatment and control streams of similar ecological parameters.

Section 8. Project description

a. Technical and/or scientific background

A more detailed background is covered in the Idaho Supplementation Studies (ISS) umbrella proposal. Study streams were partitioned among four resource management entities for implementation. These included Idaho Department of Fish and Game, Nez Perce Tribe, Shoshone-Bannock Tribe, and the U.S. Fish and Wildlife- Idaho Fishery Resource Office. Allocations were based on interest, integration with on going programs, cost efficiency, logistics and, to a lesser extent, relative equity. Approximately one-half of the study will be implemented by Idaho Department of Fish and Game through the ISS contract with BPA. The Nez Perce Tribe and Shoshone-Bannock Tribe have similar commitments to ISS, each comprising approximately 20% of the study. Both of these components rely heavily on integration of existing or proposed tribal programs. The

Idaho Fishery Resource Office will contribute less than 10% of the study implementation, most coming from investigations on Clear Creek associated with evaluations of operations at Kooskia National Fish Hatchery.

b. Rationale and significance to Regional Programs

The Northwest Power Planning Council (NPPC) has called "for immediate efforts to gather data on wild and naturally spawning stocks, review impacts of the existing hatchery system and coordinate supplementation activities" to achieve its goal of doubling anadromous fish runs in the Columbia Basin as addressed in the Columbia Basin Fish and Wildlife Program (NPPC 1994). The research goals of the Idaho Supplementation Studies are to: (1) Assess the use of hatchery chinook salmon to increase natural populations of spring and summer chinook in the Salmon and Clearwater River drainages; (2) Evaluate the genetic and ecological impacts of hatchery chinook salmon on naturally reproducing chinook populations. The relationships FWP (1994) and ISS research objectives are reviewed below:

Section 7.3B.2 -Research Objective 1-3 (Implementation Phase): Implement the high priority supplementation including monitoring and evaluation (among others).

Section 7.0A - Research Objectives 1 and 3: Identify which supplementation strategies (broodstock and release stage) will be most affective in increasing natural production without adverse effects on productivity.

Section 7.1B.1- Research Objective 2: Monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation.

Section 7.1C.3 - Research Objective 2: To establish a baseline profile for evaluation and monitoring, we will include a genetic profile analysis for treatment and control streams.

Section 7.2A - Research Objectives 1- 4: Based on the results of each of the objectives we expect to document which methods are best for supplementing existing naturally reproducing populations of chinook salmon and re-establishing naturally producing populations in stream where they have been extirpated.

Supplementation in Idaho parallels basin wide needs and concerns as well as addressing unique concerns for upriver stocks. There are supplementation projects ongoing in Washington, Oregon, and Idaho. These projects have been reviewed to enhance coordination and integration with ISS and to avoid unnecessary duplication of effort. A major contributor in this effort has been our participation in the Regional Assessment of Supplementation Project (RASP). There are also numerous supportive research or monitoring projects in Idaho that are not studying supplementation but will provide valuable data for ISS. These include IDFG, Sho-Ban Tribes, Nez Perce Tribe, USFS, NMFS, and ICFWRU. Supportive information includes parr density estimates, redd

counts, habitat characteristics, spawning distribution and behavior, fish marking, rearing and density effects, and pathogen screening.

c. Relationships to other projects

ISS is a cooperative effort between the U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, the Nez Perce Tribe, and the Shoshone-Bannock Tribes. Each cooperating agency has responsibility for investigation of different streams within Idaho. All cooperators meet together to plan project activities and discuss adaptive changes necessary to maintain project relevancy and effectiveness.

Each ISS cooperator completes requirements for National Environmental Policy Act (NEPA) with land management agencies where project activities occur on public land. ESA section 10 permits are also acquired through the National Marine Fisheries Service.

ISS collects a tremendous volume of data and much of it is requested by numerous entities in the Salmon and Clearwater drainages including: Idaho Fish and Game regions/headquarters, US Forest Service, Bureau of Land Management, NMFS, US Fish and Wildlife Service, private landowners, hatchery managers, etc. Many entities rely on the information we collect in making management decisions.

PTAGIS, administered by the Pacific States Marine Fisheries Commission, enables and assists in the use, interrogation, and data base management of Passive Integrated Transponder (PIT) tags.

ISS works closely with Lower Snake River Compensation Plan (LSRCP) to coordinate on hatchery supplementation treatments.

d. Project history (for ongoing projects)

The Idaho Salmon Supplementation (ISS) Studies in Idaho Rivers project started in 1989 as project 89098, (Idaho Department of Fish and Game, current project 8909800). In 1992, the Nez Perce Tribe, Shoshone-Bannock Tribes, and U.S. Fish and Wildlife Service were funded to assist in the ISS project as cooperative agencies with project numbers of 8909802, 8909803, and 8909801, respectively. The University of Idaho, Idaho Cooperative Fish and Wildlife Research Unit was funded to conduct small-scale investigations for the Idaho Department of Fish and Game under the ISS study.

Publications and reports to date include the initial study design (Bowles and Leitzinger 1991), small-scale studies (Peery and Bjornn 1996), and annual reports: Arnsberg (1993), Hesse and Arnsberg (1994), Hesse et al (1995), Keith et al (1996), Lietzinger et al. 1996, Lietzinger et al. 1993, Nemeth et al. 1996, and Rockhold et al. 1997. A five year summary report encompassing information from all project coordinators is in progress and nearing completion.

ISS data addressing current population levels and life history descriptions for many of the chinook salmon (including ESA listed) producing streams in the Salmon and Clearwater drainages is being utilized in the PATH process, hyrdro-system evaluations, and captive brood programs.

While not directly implemented for ISS, data collected on ISS PIT tagged chinook (wild/natural and hatchery origin) at Snake and Columbia River passage facilities will aid in mainstem smolt monitoring of time and passage requirements and may contribute to the management/modification of mainstem dam operations. Implementation of captive brood programs including: stream prioritization, collection techniques, and monitoring and evaluating techniques will use ISS data.

The management strategy, for stocking all 1994 and 1995 brood year chinook salmon as smolts, utilized the preliminary 1992-1994 ISS data analysis that demonstrated higher minimum rates of detection at mainstem fish passage facilities for smolt releases over parr and presmolt released fish.

The ISS study results and recommendations will help guide state, tribal, and federal hatchery programs. Population characteristics including historical resiliency to low return years, life history, and genetic descriptions from base line sampling will play a vital role in determining which supplementation strategy (if any) produces the best adult to adult to production without adverse genetic impacts to natural populations.

The Nez Perce Tribe has been funded for 7 years (through FY 1999)under the project 8909802. During this time annual budgets have range from $107,050 to $339,334 totaling $1,315,298.

e. Proposal objectives

Objective 1. Monitor and evaluate the effects of supplementation on presmolt and smolt numbers and spawning escapements of naturally produced salmon.

H_{01a}: Supplementation-augmentation of existing chinook populations in Idaho does not effect natural production. Corollary: Rejecting H_{01a} indicates that supplementation can enhance or deter natural production.

H01b: Supplementation-restoration utilizing existing hatchery stocks does not establish natural populations of chinook salmon in Idaho. Corollary: Rejecting H01b indicates that existing hatchery stocks can be used to restore natural populations of chinook salmon in Idaho.

Objective 2. Monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation.

H_{02a}: Supplementation-augmentation of existing chinook populations in Idaho does not reduce productivity of target or adjacent populations below acceptable levels (e.g. replacement). Corollary: Rejecting H_{02a} indicates that supplementation can conversely affect survival and performance of existing populations.

H_{02b}: Supplementation does not lead to self-sustaining populations at some enhanced level (e.g. 50% increase in abundance maintained over time.) Corollary: Rejection of H_{02b} indicates that certain supplementation strategies are successful in establishing self-sustaining populations or enhancing the level at which populations maintain themselves.

Objective 3. Determine which supplementation strategies (broodstock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity.

H_{03a}: Utilization of existing hatchery broodstocks in Idaho is not an effective strategy to supplement existing populations of chinook salmon within local or adjacent subbasins. Corollary: Rejection of H_{03a} indicates that established hatchery broodstocks for supplementation within the local or adjacent subbasin.

H_{03b}: Development of new, local broodstocks with known natural component for supplementation does not provide an advantage over utilization of existing hatchery broodstocks for supplementation within the local or adjacent subbasin. Corollary: Rejection of H_{03b} indicates that development of new supplementation broodstocks from the target populations can be more successful for supplementation than utilization of existing broodstocks.

H_{03c}: The effects of supplementation on natural production and productivity does not differ among life stages (parr, presmolt, smolt) of hatchery fish released. Corollary: Rejecting H_{03c} indicates which supplementation release strategies (life stages) are most effective (or least deleterious) in rebuilding natural populations.

Objective 4: Develop supplementation recommendations.

f. Methods

A more thorough explanation of the experimental design and methods for analysis has been provided in the ISS umbrella proposal as summarized from the Salmon Supplementation Studies in Idaho Rivers (ISS)- Experimental Design (Leitzinger and Bowles 1991). Eighteen treatment and eleven control streams in both the Clearwater and Salmon basins have been divided among four resource management entities for implementation. Each cooperator is responsible for the activities on their respective streams. The Nez Perce Tribe is responsible for the ISS project activities on Lolo, Eldorado, Newsome, Squaw, and Papoose creeks in the Clearwater basin; and Slate Creek, Johnson Creek, Lake Creek and the Secesh River in the Salmon River basin.

The specific tasks associated with their respective objective and hypotheses are also presented in Section 4 and Section 8b,e,f :

Task 1.a	Continue to implement "standardized" spawning, rearing, marking, and release protocols for supplementation programs.
Task 1.b	Differentially mark all hatchery supplementation and general production fish released in or nearby the study stream.
Task 1.c	PIT tag a minimum 800 hatchery supplementation fish prior to release for estimating smolt-to-smolt survival.
Task 1.d	Release various life stages of chinook salmon. Determine fish numbers for each life stage based on existing natural production and natural rearing capacity.
Task 1.e	Estimate late summer parr densities from snorkeling surveys.
Task 1.f	PIT tag a minimum of 800 naturally produced parr from each treatment and control stream to estimate smolt production and survival.
Task 1.g	Use existing weirs to collect, PIT tag, and enumerate emigrating fish and to identify and enumerate returning adults.
Task 1.h	Compare natural production or supplemented populations to unsupplemented populations and baseline data.
Task 2.a	Monitor productivity and genetic indices from supplemented populations and compare to baseline and controls. Productivity characteristics will be evaluated as a function of density or percent carrying capacity to minimize density dependent effects confounding treatment effects.
Task 2.b	Monitor straying of hatchery supplementation fish into adjacent and control streams by weirs and carcass surveys.
Task 2.c	Determine spawner to recruitment relationship based on determined production and productivity indices (parr and smolt numbers, adult escapements, survival, egg/spawner etc.).
Task 2.d	Predict population viability based on spawner to recruitment relationship to determine if the population will maintain itself through time in the absence of additional supplementation.

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Task 3.a	Monitor and evaluate natural production (pre smolt, smolt, and adult numbers) and productivity (survival, life stage characteristics, pathogens,

straying, genetic composition) of supplemented populations and compare to baseline and controls (unsupplemented).

Task 3.b Use local brood stocks with known natural component from the target population during the second generation of supplementation (differentiation of natural and hatchery returns possible through fin clips).

Task 3.c Compare natural production and productivity indices of supplemented populations using existing hatchery brood stocks (first generation) to populations using locally developed brood stocks (second generation).

Task 3.d Compare natural production and productivity indices among supplemented populations using parr, fall presmolt, and smolt release strategies.

Task 4.a Guidelines and recommendations will be developed addressing risks and benefits of supplementation (augmentation and restoration) in general and specific supplementation strategies (brood stock and release stage).

Description of proposed treatments, methods and evaluation:
Population responses to supplementation will be monitored a minimum of one generation (5 years) following supplementation. The experimental units are the study streams themselves. Final evaluation is ideally dependent on the response of adult escapements to treatments; several interim evaluation points will be useful in indicating initial population responses and test specific hypotheses. The production response variables which we are monitoring include:

Mid-summer parr- Parr population densities are estimated in all treatment and control streams. Number of parr is estimated with standardized snorkeling techniques using stratified systematic sampling (Scheaffer et. al. 1979). Parr densities are expanded by strata to estimate total parr densities within the experimental unit (treatment or control reach).

Fall and spring emigrants (presmolt and smolt)- Juvenile emigration numbers and timing are estimated with emigrant (rotary screw traps) traps. Traps are operated to sample the summer, fall and spring emigration period until icing or water velocity is prohibitive. Capture efficiency is estimated by recapture of marked emigrants transported above traps. Capture efficiencies are monitored as a function of stream flow and water temperature. Emigration is not studied in Squaw, Papoose, and Slate creeks.

Smolt production- Minimum survival estimates of smolts reaching Lower Granite Pool is estimated for all treatment and control streams. Approximately 700 juveniles are PIT tagged prior to or during emigration from the study streams and hatcheries. A similar number of hatchery fish are PIT tagged prior to release into treatment streams. Naturally produced parr and emigrants will be PIT tagged following collection by seining, minnow traps, electro-fishing, and/or emigration traps.

Adult escapement- Escapement to Lolo, Eldorado, and Newsome creeks is determined by an adult weirs. Underwater video escapement monitoring is being tested in the Secesh River and Lake Creek (project 9703000). Multiple redd counts are conducted in all study streams to obtain an indice of escapement to all potential spawning areas multiple times throughout the spawning season. Potential egg disposition is estimated from fecundity of females collected at nearby hatchery racks.

In addition we are looking at the following productivity response variables:

Survival - Natural production estimates for the production response evaluation points will be used to estimate survival relationships for up to eight life stage intervals. Redd (egg)-to-parr, parr-to-smolt (at Lower Granite Pool), smolt-to-redd, and redd-to-redd survival rates will be estimated for all treatment and control populations. The survival relationships will be estimated as a function of fish numbers or density.

In hatchery survival relationships will be monitored for egg-to-fry, fry-to-fall presmolt, and fall presmolt-to-release intervals. These survival rates will be measured as a function of density but are assumed to be predominately limited by density independent factors up to the hatchery capacities.

Fecundity - Fecundity schedules, by age and length, will be as measured from hatchery and natural fish collected for each supplementation brood stock and pooled across years within generations. Supplementation effects will be measured as trends in these fecundity schedules. Fecundity will not be monitored directly for populations in control streams.

Age structure - Age or return for adult male and female chinook will be determined from scales and coded-wire tags recovered from carcasses surveyed in natural spawning areas and from adults returning to weirs.

Spawning distribution - Temporal and spatial distribution of spawning will be monitored in all treatment and control streams. Run timing will be quantified directly for streams with weirs and qualitatively for study streams without weirs. Spatial distribution of spawning will be monitored by peak redd counts (ground or aerial) conducted throughout the entire study stream.

Spawning ratio - The spawning ratio will be monitored for all treatment streams. The ratio will be determined by counting marked (supplementation) v.s. umarked (natural) adult returns at weirs followed by ground carcass surveys to estimate egg retention and prespawning mortality. This information will be analyzed directly or as a covariant to indicate spawning success and progeny survival associated with various proportions of hatchery and natural spawners.

Parr distribution and growth - Relative spatial distribution of mid-summer parr will be monitored for each treatment and control stream during snorkeling activities. Parr length during mid-summer sampling will be used to indicate growth trends.

Emigration timing - Emigration timing will be monitored for study streams with weirs and juvenile traps. This information will be used to indicate shifts in the proportion of fall and spring emigrants, and the temporal distribution of emigration within each season.

Genetic composition - Genetic structure and variability will be monitored for natural and hatchery populations associated with our research. Allelic frequencies will be monitored through starch gel electrophoresis. All inferences from genetic data will incorporate other ecological (i.e. life history, health, behavior, abundance) and environmental (i.e. carrying capacity, temperature, flows, habitat) data. This information will provide a valuable tool to assess supplementation risk and track potential genetic impacts of supplementation on long term population fitness.

Critical Assumptions:
We assume that mainstem passage and flow will allow for a net replacement/increase in adult to adult production. Our efforts will be negated without improvements in mainstem passage and acceptable water flows.

Justification of Sample Size:
Sample size requirements for determining survival to Lower Granite and McNary dams are estimated using the SURPH.1 (Smith et al. 1994) SAMPLE_SIZE program. Desired precision levels are established as 95% confidence intervals within ±5% of the survival estimate. Using observed survival and detection probability rates from recent hatchery releases within the Snake River basin estimated minimum release groups of 800 (Lower Granite Dam) and 7500 (McNary Dam) smolts (or smolt equivalents) will be required . Sample sizes to obtain juvenile life history (timing and distribution) data are based on obtaining 50 (30 minimum) individual observations at Lower Granite Dam.

Methods for data analysis:
The methods for data analysis is covered in the ISS umbrella proposal. The Experimental Design also outlines statistical procedures to be used in data analysis. If substantive changes are made to the Experimental Design in the future, new statistical methods will be prescribed. Supplementation effects will be evaluated using repeated measures profile analysis (split plot through time) to test the response of populations to treatments over time as compared to untreated streams. To help partition variability, some hypotheses utilize a block design. Depending upon the specific hypothesis, blocks may include status of existing population, brood source, life stage out planted, and stream productivity.

Potential Risks:
The risks associated with ISS were evaluated under the 1991 draft RASP criteria.
ISS treatment streams already have on-going hatchery programs. Consequently, ISS hatchery protocol should pose minimal ecological risk, if any, to the chinook salmon populations in these streams. Risks are primarily associated with not conducting ISS, and failing to identify and implement the best recovery measures resulting in the continued decline or extinction of the population and adversely impacting wild\natural populations

through the use of inappropriate supplementation due to lack of information. The use of out-migrant traps and adult weirs impose a limited risk to individual animals in term of direct mortality and migration alteration.

Expected Results:
We expect this research to document the best method for supplementing existing naturally reproducing populations of chinook salmon and the best method for re-establishing naturally producing populations in streams where chinook have become extirpated. Because study streams have different ecological characteristics, supplementation effects and recommendations will likely be different for different streams.

g. Facilities and equipment

Broodstock collection and juvenile production of chinook salmon for supplementation of treatment streams utilizes existing hatcheries in Idaho. Treatments do not require additional production, but are coordinated and consistent forms of ongoing hatchery production. Costs associated producing supplementation hatchery fish are covered under individual hatchery budgets.

The Nez Perce Tribe's portion of the ISS project is conducted out of the Tribe's field office in McCall, Idaho. This office currently houses NPT personnel from three other BPA funded projects. The office facilities are adequate for all administrative and personnel needs. Both the project leader and biologist have Pentium computers.
The Nez Perce Tribe currently uses six rotary screw traps to collect data for the ISS project. Two of these traps have been purchased with ISS funding, the other four traps are coordinated with associated BPA projects. One spare trap is available for emergency use when primary traps are damaged.

We currently have one PIT tagging station, but an additional station is included in the 1999 budget for back-up use and multiple location tagging. PTAGIS is employing the use of higher frequency PIT tags in 1999. The software used in PIT tagging operations will require the use of a Pentium laptop computer. The budget request reflects the cost of purchasing the needed computer. It does not include the replacement PIT tag readers for the currently used station which will be required to read these new frequency tags. It is our understanding that these readers will be provided by BPA.

Field activities utilize a 26 foot travel trailer purchased in 1994 and three GSA fleet vehicles are utilized.

h. Budget

Personnel:

The ISS Project for the Nez Perce Tribe requires 1 Project Leader, 1 Biologist, 1 Technician and between 4 and 6 Department Aides that are employed seasonally. The remoteness of the field locations, distances between field locations, the number of field locations within the study and the number of fish handled requires a considerable number of personnel. Experience has shown that it was difficult to complete the tasks associated with such a large project with less people.

Fringe Benefits:

The fringe benefit rate is 27% for taxed staff and 12% for non-taxed employees.

Supplies, Materials, Non-Expendable Property:

This budget item is very important because it provides the project with the ability to purchase items that are required on a daily basis that allow us to function in the field and office. We often need to purchase new gear each field season because of the rigor of field activities and this line item allows us flexibility. Field conditions are exceptionally hard on items such as computers, nets and wet gear. The remoteness of field locations requires a considerable amount of varied equipment just to reach trap sites. Currently, some equipment such as snowmobile trailers are shared with other projects to help reduce costs.

Operations and Maintenance:

For efficiency purposes, the ISS Project shares office space with 4 other fisheries projects. Items such as rent and utilities are shared costs. Training costs are minimal. Repairs and maintenance costs are considerable because of rough roads in field areas and the difficulty of maintaining electronic equipment in field locations.

Capital Acquisitions:

Our project will be in need of a pit tag station to replace a station purchased several years ago. Also, we need to purchase equipment needed to reach remote field locations. Currently, we share equipment and lose our ability to reach sites if competition arises for ATV's and snowmobiles.

Pit Tags:

We need approximately 11,000 pit tags to tag fish over a 3 season period of time in 4 stream systems.

Travel:

Yearly vehicle costs are considerable because of long distances between field locations and the yearly rental fees. Vehicles are shared between projects to be efficient and cut costs. Field per diem and lodging is necessary to keep personnel accommodated in sometimes poor weather conditions and in remote locations.

Indirect Costs:

Indirect costs are negotiated between the funding agency and the Nez Perce Tribe.

Subcontractor:

Outside professional expertise is needed to review the experimental design and statistical approach because of the complexity of the project. Genetic samples are collected each year as part of the study tasks and must be sent to a laboratory for analysis.

Section 9. Key personnel

Jon Hansen is the Idaho Salmon Supplementation Project Leader. Mr. Hansen has 10 years professional experience as a fisheries biologist in the Columbia River Basin. Mr. Hansen is a certified fisheries biologist through AFS and has diverse experience in fisheries, wildlife, and forestry. This position fills 1 FTE.

Education:
Bachelor of Science, 1981 University of Montana, Missoula
Major: Wildlife Biology
Course Work , 1983 University of Wisconsin, Stevens Point
Major: Forestry Management
Masters of Science, 1997 Central Washington University
Major: Biology

Experience: Fisheries Biologist, Colville Confederated Tribes. 1988-1997. Develop and implement salmon and steelhead harvest regulations; identify salmon stocks and fishing rates through coded wire tag analysis; conduct juvenile and adult salmon population surveys; develop hatchery production goals and objectives; develop and administer proposals, budgets and contracts; write reports; review policy and environmental documents; review forest practices, conduct forest practice-fisheries related field studies; and supervise field crews.

Reports:

Hansen, J.M. 1997. Outmigration ecology of Sockeye Salmon *Oncorhynchus nerka* from Lake Osoyoos, Washington. Master Thesis. Central Washington University, Ellensburg, Washington. 61p.

Hansen, J.M. 1997. Cassimer Bar Hatchery juvenile Sockeye Salmon *Oncorhynchus nerka* outmigration from Lake Osoyoos, Washington – 1996. For the Public Utility District No.1 of Douglas County. 16p.

Hansen, J.M. 1993. Upper Okanogan River Sockeye Salmon *Oncorhynchus nerka* spawning ground survey. For the Public Utility District No.1 of Douglas County. 79p.

Jerald Lockhart is the fisheries biologist assisting with the Idaho Salmon Supplementation Study. Mr. Lockhart has 20 years of professional experience in fisheries research and management. Over the last 8 years Mr. Lockhart has conducted

intensive research on natural production of salmonids in Idaho streams and co-authored 3 reports on chinook life history and survival.

Education: Bachelor of Science, 1973 University of Nevada, Los Vegas
Major: Zoology
Graduate Studies, 1974-1976 University of Nevada, Los Vegas
Major: Aquatic Biology
Master of Science program 1992-present University of Idaho
Major: Natural Resources Management (June 1999 completion)

Paul A. Kucera, Director of Biological Services, Nez Perce Department of Fisheries Resources Management is the program leader for the Idaho Salmon Supplementation Project. Mr. Kucera has 23 years experience as a professional fisheries biologist in research, management and administration and is a Certified Fisheries Scientist with AFS. He has authored seven peer-reviewed fisheries journal publications and over 40 gray literature reports. Responsible for technical program direction and administration of the Fisheries Research Division. This position fills 0.1 FTE.

Education: Bachelor of Science, 1975 Utah State University
Major: Fisheries Management
Graduate Studies 1984-1987 University of Idaho
Major: Fisheries Management

Jay Hesse is the Research Coordinator, Nez Perce Department of Fisheries Resources, which supervises the project leader of the Idaho Salmon Supplementation Project. Mr. Hesse has five years professional experience as a fisheries research biologist and as the research coordinator. Responsible for technical direction and supervision of all research division projects, research coordination, and tribal fisheries research representation at federal and state meetings. This position fills 0.05 FTE.

Education: Bachelor of Science, 1992 Michigan State University
Major: Fisheries
Masters of Science, 1994 Michigan State University
Major: Fisheries and Wildlife

Section 10. Information/technology transfer

Technical information is distributed through annual progress reports for individual study sites. A five year progress report including information from all project coordinators will be completed shortly. In 2007 and 1015, project summary reports will be completed. Project cooperators meet regularly to exchange information and discuss project adaptations.

ISS cooperators collect a large volume of data, and much of it is requested by numerous entities in the Salmon and Clearwater drainages including: Idaho Fish and Game regions/headquarters, US Forest Service, Bureau of Land Management, National

Marine Fisheries Service, US Fish and Wildlife Service, private landowners, hatchery managers, etc. Many entities rely on the information we collect in making management decisions. There is a tremendous amount of information transfer between ISS and other entities.

Congratulations!